



ST[EMpower]



SCIENCE, TECHNOLOGY,
ENGINEERING, AND MATH
COLORADO STATE UNIVERSITY
EXTENSION

Science

Technology

Engineering

Mathematics

Empower Your Students with the Power of STEM

Meeting and Exceeding the Colorado Academic Science Standards by addressing the underlying scientific concepts.

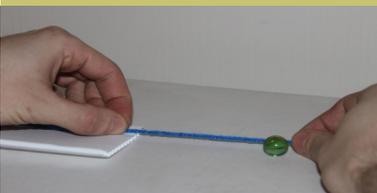
Each lesson is also aligned with the Next Generation of Science Standards.



Colorado State University Extension 4-H programs are available to all without discrimination.

KIT COSTS

| | |
|----------------------------|---------|
| Moving Makers: | \$50.00 |
| Moving Makers Restock Kit: | \$25.00 |



Many Ways of Belonging—Objects: \$220.00

Many Ways of Belonging—Objects Restock Kit: \$40.00



ST[EMpower]

Kits come in a plain white box. We want to ensure that your money is spent on fun and engaging science, not window dressing.



KINDERGARTEN

Moving Makers

Meets and Exceeds Physical Science Standard:

1. Objects can move in a variety of ways that can be described by speed and direction



Four lessons explore the evidence outcomes of this standard, plus one career connection lesson:

- Material of the object influences how it moves
- Explore how objects move by speed (height of ramp)
- Explore friction and movement (ramp surface)
- Explore how different objects move (roll or slide)
- Career Connection in science and engineering

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

Many Ways of Belonging—Objects

Meets and Exceeds Physical Science Standard:

2. Objects can be sorted by physical properties, which can be observed and measured



Nine lessons explore the evidence outcomes of this standard, practice conceptual flexibility (thought to be a necessity for success in school), plus one career connection lesson:

- Identify and recall the names of the 7 geometric shapes used in all subsequent lessons
- Practice both dichotomous keys and Venn diagrams to sort objects
- Distinguish between random and patterns that have meaning
- Use random patterns to make sense of something (i.e. patterns of stars to identify constellations, which are used to map the sky)
- Identify geometric shapes that are found in the real world (i.e. a rectangular window and door, a circular classroom clock)
- Practice conceptual flexibility through employing different criteria to sort objects (i.e. size, color, material, and shape of the objects)
- Extend each sort criteria activity with explorations in measurement, primary colors in pigments, conducting a test on materials, and using shapes in artwork (each a separate lesson)
- Career Connection: Civil Engineers use these shapes (both 2D and 3D) in their work—build a structure that will withstand a fan breeze

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

KINDERGARTEN (continued)

Many Ways of Belonging—Organisms

Meets and Exceeds Life Science Standard:

1. Organisms can be described and sorted by their physical characteristics

Five lessons explore the evidence outcomes of this standard, plus one career connection lesson:

- 5 kingdoms of life
- Within the 5 kingdoms
- Mammals
- Other really fun stuff
- Career Connection

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

Here Comes the Sun

Meets and Exceeds Earth Systems Science Standard:

1. The Sun provides heat and light to Earth

Seven lessons explore the evidence outcomes and one career connection lesson that include:

- Explore shadows - Earth's relationship to the Sun through changing shadows over the course of one day
- Practice reading a thermometer
- Collect temperature data to build a classroom graph
- Collect day and night temperatures to recognize day is warmer than night because of the sun
- Explore the sun's impact on plants through scientific experiments
- Envision being a scientist

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.



KIT COSTS

Many Ways of Belonging—Organisms:
TBD

Many Ways of Belonging—Organisms Restock Kit:
TBD



Here Comes the Sun:
\$120.00

Many Ways of Belonging—Objects Restock Kit:
\$35.00



KIT COSTS

Solids & Liquids & Gases, Oh My!:

\$150.00

Solids & Liquids & Gases, Oh My!

Restock Kit:

\$77.00



Generations of Genetic Variation:

\$180.00

Generations of Genetic Variation Restock Kit:

\$59.00

ST[EMpower]

Kits come in a plain white box. We want to ensure that your money is spent on fun and engaging science, not window dressing.



FIRST GRADE

Solids & Liquids & Gases, Oh My!

Meets and Exceeds Physical Science Standard:

1. Solids and liquids have unique properties that distinguish them

Five lessons explore evidence outcomes and one career connection lesson that include:

- Some chemicals, when they are mixed remain a mixture
- Some chemicals, when they are mixed, undergo a reaction and change into something new
- States of matter and phase changes from solid to liquid to gas depends on increasing heat (energy)
- Difference between mixtures and reactions, and the different states of the chemicals
- Envision being a chemist



Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

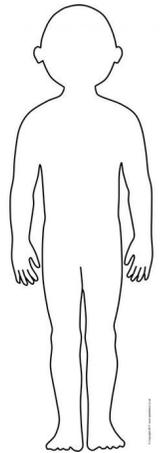
Generations of Genetic Variation

Meets and Exceeds Life Science Standard:

1. Offspring have characteristics that are similar to but not exactly like their parents' characteristics

Five lessons explore the evidence outcomes and one career connection lesson that include:

- Students will identify their classmate's parents based on shared characteristics
- Identify beagle parents and puppies based on shared characteristics
- Read a story about a beagle
- Identify the characteristics that help a puma (mountain lion) survive
- Determine which traits are acquired and which traits are inherited
- Identify offspring are like their parents because they inherit the traits randomly from their mother and father
- Discover a few careers in life sciences



Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

FIRST GRADE (continued)

Staying Alive

Meets and Exceeds Life Science Standard:

2. An organism is a living thing that has physical characteristics to help it survive

Six lessons explore the evidence outcomes and one career connection lesson that include:

- Classify characteristic traits of arthropods
- Classify characteristics of insects, arachnids, millipedes, centipedes, and crustaceans
- Examine the behavior of different groups of arthropods
- Explore the needs of plants through scientific experiments
- Discover a few careers in life sciences



Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

Mining for Minerals

Meets and Exceeds Earth System Science Standard:

1. An organism is a living thing that has physical characteristics to help it survive

XX lessons explore the evidence outcomes and one career connection lesson that include:

- Discover a few careers in geological sciences

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.



KIT COSTS

Staying Alive:

\$150.00

Solids & Liquids & Gases, Oh My!

Restock Kit:

\$59.00



Mining for Minerals:

\$199.00

Mining for Minerals:

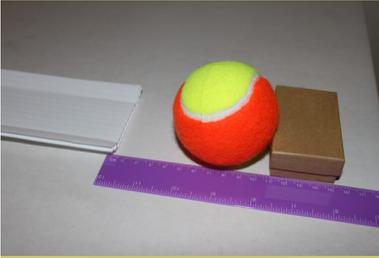
Restock Kit:

TBD



KIT COSTS

Motion Commotion:
\$50.00



SECOND GRADE

Motion Commotion

Meets and Exceeds Physical Science Standard:

1. Changes in speed or direction of motion are caused by forces such as pushes and pulls

Six lessons explore the evidence outcomes and one career connection lesson that include:

- Explore the first law of motion—*inertia*
- Explore the second law of motion— $F=ma$
- Explore the third law of motion—*action/reaction*
- Explore transfer of energy
- Examine careers in physical science

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.



Habitat Sweet Habitat:
TBD

Habitat Sweet Habitat:
Restock Kit:
TBD

Habitat Sweet Habitat

Meets and Exceeds Life Science Standard:

1. Organisms depend on their habitat's nonliving parts to satisfy their needs

Six lessons explore the evidence outcomes and one career connection lesson that include:

-

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

ST[EMpower]

Kits come in a plain white box. We want to ensure that your money is spent on fun and engaging science, not window dressing.



SECOND GRADE (continued)

Form and Function

Meets and Exceeds Life Science Standard:

2. Each plant or animal has different structures or behaviors that serve different functions

Six lessons explore the evidence outcomes and one career connection lesson that include:

-

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

Weather Bear

Meets and Exceeds Earth Systems Science Standard:

1. Weather and the changing seasons impact the environment and organisms such as humans, plants, and other animals

Eight lessons explore the evidence outcomes and one career connection lesson that include:

- Climate and weather concepts
- Accurately reading a thermometer
- Exploring microclimates
- Identifying cloud types and what they commonly mean in terms of precipitation
- Using temperature and cloud type to predict tomorrow's weather
- Collection data on predictions
- Meet Colorado Climatologist, Dr. Nolan Doesken, and envision what it would be like to have his job

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.



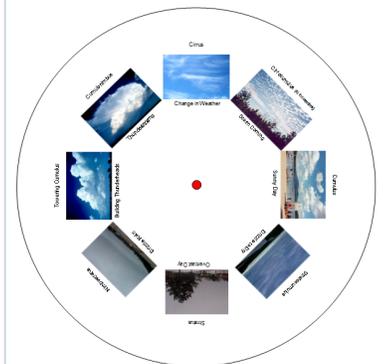
KIT COSTS

Form and Function: TBD
Form and Function:
Restock Kit: TBD

Weather Bear: \$160.00

Weather Bear:
Restock Kit: \$65.00

Template for Activity 7



Photographs of clouds captured May 19, 2014 from the National Oceanic and Atmospheric Administration website <http://www.noaa.gov/the-terminal/visualizations>

COMING SOON

ST[EMpower]

Kits come in a plain white box. We want to ensure that your money is spent on fun and engaging science, not window dressing.



THIRD GRADE

Cool Phase Changes

Meets and Exceeds Physical Science Standard:

1. Matter exists in different states such as solids, liquids, and gases and can change from one state to another by heating and cooling

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

Rhythm of Life

Meets and Exceeds Life Science Standard:

1. The duration and timing of life cycle events such as reproduction and longevity vary across organisms and species

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

You Rock!

Meets and Exceeds Earth Systems Science Standard:

1. Earth's materials can be broken down and/or combined into different materials such as rocks, minerals, rock cycle, formation of soil, and sand – some of which are usable resources for human activity.

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

FOURTH GRADE

Electric Shock

Meets and Exceeds Physical Science Standard:

1. Energy comes in many forms such as light, heat, sound, magnetic, chemical, and electrical

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

Tree of Life

Meets and Exceeds Life Science Standard:

1. All living things share similar characteristics, but they also have differences that can be described and classified

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

Life of the Past

Meets and Exceeds Life Science Standard:

2. Comparing fossils to each other or to living organisms reveals features of prehistoric environments and provides information about organisms today

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

FOURTH GRADE

Needs of Life

Meets and Exceeds Life Science Standard:

3. There is interaction and interdependence between and among living and nonliving components of ecosystems

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

Our Earth and Other Worlds

Meets and Exceeds Earth Systems Science Standard:

1. Earth is part of the solar system, which includes the Sun, Moon, and other bodies that orbit the Sun in predictable patterns that lead to observable paths of objects in the sky as seen from Earth

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

FIFTH GRADE

Separating Mixtures

Meets and Exceeds Physical Science Standard:

1. Mixtures of matter can be separated regardless of how they were created; all weight and mass of the mixture are the same as the sum of weight and mass of its parts

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

Multicellular Systems Working Together

Meets and Exceeds Life Science Standard:

1. All organisms have structures and systems with separate functions

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

Human A&P (Anatomy and Physiology)

Meets and Exceeds Life Science Standard:

2. Human body systems have basic structures, functions, and needs

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

Sol!

Meets and Exceeds Life Science Standard:

1. Earth and Sun provide a diversity of renewable and nonrenewable resources

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

COMING SOON

COMING SOON

FIFTH GRADE

Separating Mixtures

Meets and Exceeds Physical Science Standard:

1. Mixtures of matter can be separated regardless of how they were created; all weight and mass of the mixture are the same as the sum of weight and mass of its parts

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

Multicellular Systems Working Together

Meets and Exceeds Life Science Standard:

1. All organisms have structures and systems with separate functions

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

Human A&P (Anatomy and Physiology)

Meets and Exceeds Life Science Standard:

2. Human body systems have basic structures, functions, and needs

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

Sol!

Meets and Exceeds Life Science Standard:

1. Earth and Sun provide a diversity of renewable and nonrenewable resources

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

ST[EMpower]

Kits come in a plain white box. We want to ensure that your money is spent on fun and engaging science, not window dressing.



MIDDLE SCHOOL/HIGH SCHOOL

Soil: It's Alive (Developed by USDA)

Plants need nutrients to photosynthesize and grow. Most nutrients in the soil are not in a plant available form. Soil organisms convert soil nutrients into a form that is available to the plants. Many plants "leak" or exude sugars (and other compounds) into the soil to feed soil organisms in exchange for plant available nutrients.

In this game, the students (target grade = 6th or 10th) will play the roles of sun, plant leaves, plant roots, bacteria, fungi, protozoa and nematodes. The soil organisms will try to obtain "solar energy" in the form of candy (starbursts) in exchange for nutrient candies (tootsie rolls). The organisms will play different roles in exchanging nutrient candy for solar candy. During the game, the soil organisms will have to adapt to changing soil conditions when the Queen/King rolls the soil condition dice!



KIT COSTS

Soil: It's Alive:

\$100.00

Restock kit available.
Please call for price.

Photosynthesis vs. Cellular Respiration—Seventh Grade

Meets and Exceeds Seventh Grade Life Science Standard:

4. Photosynthesis and cellular respiration are important processes by which energy is acquired and utilized by organisms

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

Photosynthesis vs. Cellular Respiration—HS

Meets and Exceeds HS Life Science Standard:

4. The energy for life primarily derives from the interrelated processes of photosynthesis and cellular respiration. Photosynthesis transforms the sun's light energy into the chemical energy of molecular bonds. Cellular respiration allows cells to utilize chemical energy when these bonds are broken.

Restock kit available!

Each year, you can present this lesson with ease, knowing all your consumable items have been restocked.

COMING SOON

KIT COSTS

Electricity—Basics
\$120.00

Electricity: Grab & Go
\$90.00

Both Electricity Kits
\$200.00

Geology:
\$135.00

Invertebrates:
\$105.00

ST[EMpower]

Kits come in a plain white box. We want to ensure that your money is spent on fun and engaging science, not window dressing.



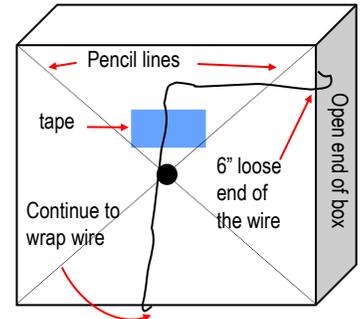
4-H SCHOOL ENRICHMENT & PROGRAMS

Electricity – Basics

All the basics to present engaging electricity lessons for classroom enrichment, out-of-school fun, or 4-H projects. Utilize the 4-H project book curriculum if you want your youth to work through the materials at their own pace, or the C.A.S.T.L.E. curriculum for MS/HS classrooms.

Electricity: Grab & Go!

Together with the Electricity—Basic kit, present 6 lessons on the basics of electricity and electrical generation and 1 lesson on career connections. Includes all supplies needed to present to classrooms and out-of-school time for up to 30 youth.



Purchase both Kits for a 5% savings!
Electricity – Basics and Electricity Grab & Go!

Geology

The equipment and supplies for school enrichment, out-of-school fun, or a future Colorado State 4-H Geology/Paleontology project (in development by Drs. Andrew Warnock and Barbara Shaw). Use a variety of resources for your lessons.



Invertebrates (entomology emphasis)

Begin the fascinating journey into invertebrate zoology with the equipment and supplies in this kit to support your K-12 school enrichment, out-of-school fun, or 4-H projects. Utilize the 4-H project book curriculum.



Authors

Dr. Barbara J. Shaw, Colorado State University Extension Western Region STEM Specialist, 4-H Youth Development

Tom Lindsay, retired HS science teacher (AP and IB Chemistry, Physics, Biology, and Calculus) and university instructor (geology and paleontology)

Nicole Covington Goza, Colorado State University, Montrose County 4-H Associate (photographs)

Retta Bruegger, Colorado State University Extension Western Region Range Management Specialist (photographs)

Acknowledgments

Funding for this project provided by Colorado State University System Venture Capital Fund

CJ Mucklow, Colorado State University Extension Western Regional Director, Annette Haas, Colorado State University Extension State Office, State STEM/4-H Specialist, and Kellie Clark, Colorado State University Extension Western Region Program Assistant

Dr. Joe Cannon and Marketing Strategies students: Berlyn Anderson, Jenna Balsley, Rachel Kassirer, Rachel Richman, Colorado State University, College of Business, for marketing strategies and kit graphics.



ST[EM]power

Joanne Littlefield, Colorado State University Extension Director of Communications and Doug Garcia, Colorado State University Creative Services Communication Coordinator/ Designer

| STEM Kit | Price | Quantity | Total |
|--|----------|----------|-------|
| Kindergarten: | | | |
| Physical Science 1: Moving Makers | \$50.00 | | |
| Restock kit | \$25.00 | | |
| Physical Science 2: Many Ways of Belonging – Objects | \$220.00 | | |
| Restock kit | \$40.00 | | |
| Life Science 1: Many Ways of Belonging – Organisms | TBD | | |
| Restock kit | TBD | | |
| Earth Systems Science 1: Here Comes the Sun | \$120.00 | | |
| Restock kit | \$35.00 | | |
| First Grade: | | | |
| Physical Science 1: Solids and Liquids and Gases, Oh My! | \$150.00 | | |
| Restock kit | \$80.00 | | |
| Life Science 1: Generations | \$180.00 | | |
| Restock kit | \$60.00 | | |
| Life Science 2: Staying Alive | \$150.00 | | |
| Restock kit | \$60.00 | | |
| Earth Systems Science 1: Mining for Minerals | 199.00 | | |
| Restock kit | TBD | | |
| Second Grade: | | | |
| Physical Science 1: Motion Commotion | \$50.00 | | |
| Life Science 1: Habitat Sweet Habitat | TBD | | |
| Restock kit | TBD | | |
| Life Science 2: Form and Function | TBD | | |
| Restock kit | TBD | | |
| Earth Systems science 1: Weather Bear | \$160.00 | | |
| Restock kit | \$65.00 | | |

| STEM Kit | Price | Quantity | Total |
|---|--------------------|----------|-------|
| Middle School / High School | | | |
| It's Alive (6 Grade or 10 Grade) | \$100.00 | | |
| Restock kit | Call for \$ | | |
| Cellular Respiration | TBD | | |
| Restock Kit | TBD | | |
| Photosynthesis | TBD | | |
| Restock Kit | TBD | | |
| 4-H Curriculum | | | |
| Electricity – The Basics | \$120.00 | | |
| Electricity: Grab & Go! (must have Electricity – The Basics) | \$90.00 | | |
| Electricity – The Basics AND Electricity Grab & Go! (5% discount) | \$200.00 | | |
| Geology – Rocks and Minerals | \$135.00 | | |
| Invertebrates – Emphasis on Entomology | \$105.00 | | |
| Subtotal | | | |
| Discount Code: _____ | | | - |
| UPS (charges determined when shipped) | | | |
| Agent Express (no cost shipping, but the kit may take up to 4 weeks to arrive) | | | 0.00 |
| GRAND TOTAL | | | |



SHIPPING

We offer two choices for shipping:

- **UPS:** The cost of shipping your kit(s) to you will be added to your statement. We do not charge a handling fee. The only cost will be postage.
- **Agent Express:** We will move your kits from Montrose to your county when an Extension Staff travels.

Restock Kits!

The Kindergarten, First, and Second Grade kits also come with a Restock Kit option. Keep the equipment and restock all the consumable items to use the kit over and over.

If you need to replace any piece of equipment (lost or broken), we can help you with that. Call Dr. Barbara Shaw.

Dr. Barbara J. Shaw
 Western Regional STEM Specialist
 360-513-7916 (mobile)
 Barbara.Shaw@ColoState.edu

Shipping Information:

Name: _____

Address: _____

Phone: _____

Email: _____

The kits will be charged when delivered to UPS or to Agent Express

Complete by county extension office:

County / staff contact: _____

Subtotal: _____ 10% of sale: _____



SCIENCE, TECHNOLOGY,
ENGINEERING, AND MATH
COLORADO STATE UNIVERSITY
EXTENSION

ST[EMpower]



Why STEM?

The United States is facing a critical need for a workforce with strong Science, Technology, Engineering, and Math (STEM) skills. Based on data from the National Academy of Sciences, the US ranked 15th out of 65 countries in science literacy, and only 23rd in science proficiency. In math literacy, the US ranked 28th, however in math proficiency, we only ranked 31st. Overall, the US was ranked 40th in innovation-based competitiveness.

We live in a world that is becoming ever increasingly dependent on technology, and if we are to remain competitive in a global market, we must prepare our youth.

Research states that the best predictors of a future career is interest and not grades. By providing multiple opportunities in fun and engaging STEM activities, students can discover their interests in these fields.

STEM readiness involves students learning real life skills providing opportunities or failures. Failure can be viewed as an ordinary process of innovation. Students engage in hands-on learning, which encourages them to develop their creativity while developing and nurturing a strong interest in STEM subjects. Experiential learning provides a platform for each student to learn by reflection on doing. Teachers guide students, help them remain focused in exploration, which in turn enhances engaged students in exploration that promotes creativity, innovation and lifetime learning.

Each of the K-12 kits also include a career connection, so that students can begin to visualize this as a rewarding future for themselves.

Kits for K-12 Educators:

Each kit is designed to not only meet, but exceed, a specific science standard by addressing the underlying scientific concepts and utilizing experiential learning. Not only are these kits hands-on inquiry, but also fun and engaging for the students. Youth learn best by doing, and play is an important component for exploring this world.

Teachers need to meet over 100 standards every year, and students learn best by being exposed to content 12-15 times. In reality, there just is no time during a regular school year. The only option is to present multiple standards. These kits meet that challenge by naturally incorporating math, social studies, RWC (reading and communicating) and visual art standards.

Every unit comes with a career connection to start students visualizing themselves in these careers!

All kits meet underlying scientific concepts, are fun and engaging for youth, and fun for you to present!

Each K-5 lesson meets additional standards in Mathematics, The Arts, Social Studies, and RWC.

K-12 lessons include: identifying the nature of science, how to meet Depth of Knowledge, ideas for expanding the lessons, ideas for meeting additional standards, using these lessons as a theme to present other standards, and how the experiential learning lends itself to the scientific method, suggested vocabulary, and fascinating facts.

Kits for 4-H:

These kits are designed for flexibility to meet multiple ages in a school, after school, or special event setting. You will use a variety of curricula from suggested resources. For example, the electricity basic kit will get youth started with the 4-H electricity project. The Grab & Go Electricity curriculum kit translates the 4-H Electricity Project book, Magic of Electricity, into a program you can present to a group.

For more information:

Dr. Barbara J. Shaw
Western Regional STEM Specialist
360-513-7916 (mobile)
Barbara.Shaw@ColoState.edu

Ordering kits:

Kellie Clark
Western Region Program Assistant
970-241-3346
Kellie.Clark@ColoState.edu

Colorado State University, U.S. Department of Agriculture and Colorado counties cooperating. CSU Extension programs are available to all without discrimination. No endorsement of products mentioned is intended nor is criticism implied of products not mentioned.

© Colorado State University
Extension. 8/18 www.ext.colostate.edu